

Case Report Rapport de cas

Presentation, treatment, and outcome of squamous cell carcinoma in the perineal region of 9 goats

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Abstract — Nine goats were treated for squamous cell carcinoma (SCC) of the perineal and/or tail region. This case series is the first detailed description of clinical presentation and treatment of caprine SCC in North America and characterizes the potential risk factors and outcomes.

Résumé — **Présentation, traitement et issue du carcinome squameux dans la région périnéale chez 9 chèvres.** Neuf chèvres ont été traitées pour le carcinome squameux (CS) de la région périnéale et/ou de la queue. Cette série de cas est la première description détaillée de la présentation clinique et du traitement du CS caprin en Amérique du Nord et caractérise les facteurs de risque et les issues potentielles.

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Squamous cell carcinoma (SCC) is a malignant tumor of epithelial origin, whose etiology is multi-factorial, involving genetics of skin pigmentation, ultraviolet (UV) light exposure, viruses, and age (1,2). Lesions of SCC in small ruminants have been reported worldwide, predominantly in countries with hot climates and high UV light exposure (1,3–7). Squamous cell carcinomas are the most common epithelial neoplasm reported on histopathology in goats in North America (8,9).

This case series is the first to describe the clinical presentation, treatment, and outcome of perineal SCC in goats in North America. Perineal tumors can have significant welfare considerations as a result of erosion and ulceration (1), interference with defecation and urination (10), myiasis (3), and can result in economic losses (3). Table 1 summarizes the signalment, presentation, and outcomes of the cases.

Case descriptions

Case 1

Physical examination revealed a 3-cm pedunculated ulcerated mass dorsal to the rectum with multiple raised lesions in the

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perineal region and tail. Initial cytology of the mass from a skin scraping revealed sheets of vacuolated epithelial cells with some anisokaryosis and bacteria. The goat was sedated with xylazine hydrochloride (Anased; Lloyd, Shenandoah, Iowa, USA), 0.07 mg/kg body weight (BW) once and received a local anesthesia block around the mass using lidocaine (Lidocaine 2%; VetOne, Boise, Idaho, USA). The mass was surgically removed and the multiple smaller masses were treated with liquid nitrogen cryotherapy using a controlled closed tipped technique in 2 freeze thaw cycles (2). The sedation was reversed using tolazoline (Tolazoline; Lloyd) at 2 mg/kg BW, SC, once. Histopathology confirmed the diagnosis of SCC. The goat was discharged the day of surgery and survived 3 y following surgery with no recurrence.

Case 2

Physical examination revealed a 4-cm ulcerated friable mass extending from the dorsal wall of the anal sphincter. On digital rectal examination, the mass extended 1 cm into the rectum. There were multiple other masses on the ventral perineal region. The rest of the physical examination was unremarkable. Prior to surgery the goat received flunixin meglumine (Banamine; Intervet, Millsboro, Delaware, USA), 2.2 mg/kg BW, IV, once and 2 mL of a tetanus toxoid vaccine (Vision CD-T with Spur; Intervet). The goat was sedated with xylazine hydrochloride once at 0.2 mg/kg BW, IV and the mass was surgically excised. The subcutaneous tissues were closed with 2-0 polygalactin 910 (Vicryl; Ethicon, Somerville, New Jersey, USA) in a simple continuous pattern and the skin edges closed using 0.4 mm polymerized caprolactam (Vetafil; Ethicon) in a simple interrupted pattern. Cryotherapy, using a carbon dioxide (CO₂) unit with a closed tip technique, was used on the remainder of the smaller masses. Sedation was reversed using tolazoline.

A diagnosis of SCC was made based on histopathology. The goat received 3 treatments at monthly intervals for ulcers on the perineum with hyperkeratotic masses lateral to the rectum. The goat was sedated with xylazine and a caudal epidural with lidocaine was administered. Flunixin meglumine was administered intravenously. Cryotherapy was repeated as previously described. Sedation was reversed with tolazoline. Topical silver sulfadiazine cream (Silvadene cream 1%; King Pharmaceuticals, Bristol, Tennessee, USA) was applied for 3 d after surgery. The goat returned 1 and 2 mo later for repeat cryotherapy treatments on the smaller masses following the same protocol. Cryotherapy was not effective in decreasing the size of all of the remaining masses and the goat was again presented for surgical removal of the remaining masses. The goat was sedated and a caudal epidural given as previously described. The goat was treated with flunixin meglumine and ceftiofur crystalline free acid (Excede; Pfizer Animal Health, New York, New York, USA), 6.6 mg/kg BW, SC, behind the ear, once prior to surgery. Ten months later the goat returned with a new perineal lesion ventral to the anus. Cryotherapy was performed using a local lidocaine infusion around the mass and manual restraint. The goat also received a tetanus toxoid vaccine. Twelve months later the goat presented for further small masses around the perineal region. Sedation, caudal epidural, anti-inflammatory drugs, and cryotherapy were repeated. Ceftiofur hydrochloride was given at 2.2 mg/kg BW, IM, q24h for 3 d. The goat returned 8 mo following the previous treatment for small lesions (largest 1 cm in diameter) that were removed with cryotherapy with a local lidocaine anesthetic block, and again 4 mo later for removal by cryotherapy under xylazine sedation. Flunixin meglumine was also administered at that time.

Cases 3 and 4

Goats 3 and 4, from the same herd, presented with proliferative masses on their perineal region. Goat 3 also had ulcerated areas on the ventral aspect of the tail and Goat 4 had inappropriate lactation and a mucoid vaginal discharge. A wedge biopsy of the mass was taken from Goat 4, histopathology was consistent with SCC. Both goats underwent mass removal with xylazine hydrochloride sedation and a lumbosacral epidural performed with lidocaine. Prior to surgery, both goats received flunixin meglumine, oxytetracycline (Liquamycin LA200; Pfizer Animal Health), 18 mg/kg BW, SC prior to mass removal and the oxytetracycline was repeated once in 48 h and a tetanus toxoid vaccine was administered. The deep layers and the subcutaneous tissues were closed together using 2-0 polygalactin 910. The skin was apposed using 2-0 polydioxanone (PDS II; Ethicon) in a simple continuous suture pattern. The smaller lesions on the tail were removed using CO₂ cryotherapy. Sedation was reversed using tolazoline. One month following surgery, the masses returned on Goat 3 and she was euthanized; however, no necropsy was performed. Twelve months later, Goat 4 continued to have no recurrence of lesions.

Case 5

Goat 5 was from the same herd as 3 and 4 but presented 11 mo later. On physical examination there were numerous elevated

and ulcerated masses (2 mm to 2 to 3 cm in size) around the anus that the owner reported as being pruritic. The masses did not involve the rectal mucosa. The rest of the physical examination was unremarkable. The goat was sedated with xylazine hydrochloride and a caudal epidural was performed with lidocaine. The goat also received flunixin meglumine and tulathromycin (Draxxin; Pfizer Animal Health), 2.5 mg/kg BW, SC, once prior to surgery. The mass was debulked and cryotherapy with CO₂ was performed along the edges of the mass. Cryotherapy was repeated 24 h later. Flunixin meglumine was repeated once after surgery. A diagnosis of SCC was made on histopathology. One month following surgery, no masses were visible on the perineum. On follow-up call 17 mo later, the owner reported reddened areas, but no masses on the perineum.

Case 6

Physical examination revealed a hemorrhagic mass approximately 6 cm × 8 cm. The mass encircled the anus and extended into the rectum 2 to 3 cm. The goat also had a resolving infectious keratoconjunctivitis ulcer. Epidural anesthesia was performed using lidocaine and the mass was removed with margins of healthy perineal skin. A rectal pull through surgery was performed to remove the affected rectal mucosa. Procaine penicillin G (PenAqueous; Aspen Veterinary Resources, Liberty, Missouri, USA), 22 000 IU/kg BW, IM, q12h, was given for 5 d. The mass was submitted for histopathology and a diagnosis of SCC with associated suppurative and lymphoplasmacytic inflammation was made. The goat was monitored for 39 d in the hospital, there was no evidence of further development of neoplastic tissue. Three months after the initial surgery, the goat returned for perianal nodules and ulcerative necrotic mammary lesions. Euthanasia was elected and a necropsy examination performed. Gross necropsy revealed several firm, round subcutaneous masses of the perineal region, which extended into the pelvic cavity. Histopathology was consistent with SCC with metastasis to the sub-lumbar, iliac and ischiatic lymph nodes.

Case 7

Goat 7 was from the same herd as Goat 6. On physical examination there were several raised thickened lesions around the anus. The rest of the physical examination was within normal limits. Lidocaine was infused as a local block around the lesions and cryotherapy using CO₂ was performed. The goat was discharged the same day. No biopsy was performed on the masses due to the previous case from the same herd. No follow-up was available.

Case 8

On physical examination the mass was located in the perineal region and involved the anal sphincter. The mass measured 12 cm × 12 cm × 8 cm, was cauliflower-like, ulcerated and friable, with a foul odor (Figure 1). The udder was enlarged with serum-like secretions, the mammary tissue was soft on palpation, and the supramammary lymph nodes were within normal limits. A presumptive diagnosis of inappropriate lactation was made for the enlarged udder. The goat was sedated with xylazine hydrochloride and a lumbosacral epidural with lidocaine was performed. Prior to surgery the goat received tulathromycin



Figure 1. Squamous cell carcinoma on the perineal region of Goat 8.

and flunixin meglumine. During surgery the goat received 3 additional doses of xylazine hydrochloride and a lumbosacral epidural using 2.25 mg morphine sulfate (Morphine sulfate; Westward, Eatontown, New Jersey, USA). Due to hemorrhage during surgery, the goat was given a 500-mL blood transfusion and 1 L of Lactated Ringer's solution (Lactated Ringer's solution; Baxter Healthcare Corporation, Deerfield, Illinois, USA) was administered intravenously over the following 12 h. The mass was removed along with approximately 3 cm of the rectum including the anal sphincter. Cryotherapy using CO₂ was used on the subcutaneous tissue of the rectum and perineum to provide hemostasis and to extend tissue trauma beyond the incised edges. Polygalactin 910 2-0 was used to place vertical mattress and simple interrupted sutures to appose the mucosa to the skin. Flunixin meglumine was continued daily for 2 d following surgery. Histopathology was consistent with SCC. The goat was discharged 3 d after surgery. Twelve days later there was healthy granulation tissue in the perineal region. Three weeks after the initial recheck the goat presented for regrowth of lesions at the previous site and new growths on the surrounding perineal skin. On physical examination there were lesions measuring 3 cm × 3 cm × 1 cm and 1 cm × 1 cm × 1 cm around the anus and there was a firm mass at the base of the udder in the region of the supra-mammary lymph nodes. The goat was sedated with xylazine hydrochloride and a fine-needle aspirate of the mammary mass was performed. Cytology indicated metastasis to the supramammary lymph node. The goat was discharged for euthanasia at home at the owner's request and no necropsy was performed.

Case 9

On physical examination, the perineal mass was ulcerated and on the dorsal aspect of the vulva. Additionally, there were masses in the left and right hind interdigital spaces and a vagi-

nal discharge was present. Transrectal ultrasound, vaginoscopy, culture of vaginal discharge, complete blood cell count, and serum chemistry revealed changes consistent with chronic inflammation as a result of endometritis. The goat was sedated with xylazine hydrochloride, followed by an additional dose given 1 h into surgery for surgical debulking and removal of the interdigital and vulvar masses, followed by cryotherapy. The goat was treated with tetanus toxoid vaccine, procaine penicillin G for 8 d, and flunixin meglumine for 2 d. Histopathology was consistent with SCC and the interdigital masses were proliferative granulation tissue with chronic suppurative inflammation. Long-term follow-up was not available.

Discussion

In sheep, SCCs are frequent in Australia where UV light exposure is high for much of the year, and the reported prevalence ranged from 0.08% at slaughter (3) to 4% on-farm (4). Data including prevalence in goats are lacking in the literature. A retrospective study of histopathological samples from a North American diagnostic laboratory found squamous cell carcinomas in 10 goats, the second most common neoplasm in that study, and the most common epithelial neoplasm (9). Similar findings were reported in 2011 (8). Squamous cell carcinomas have been identified in sheep that previously had papillomas in the same location on the face (11) and papilloma virus particles were identified in the mass. Papilloma virus was also identified by electron microscopy and DNA sequencing in a SCC from the vulva of a ewe (11,12). A novel ovine papillomavirus, *Ovis aries* Papillomavirus 3, was detected in tumor lesions in sheep by Alberti et al (13). Papilloma-SCC has been reported on the udder of a Saanan goat (6); however, further investigation of the papilloma virus in the etiology of SCC in goats has not been undertaken. If papillomavirus is associated with the development of perianal SCC in goats, it is possible that transmission within a herd is facilitated by a vector (flies).

In sheep, short tail docking and the Mulesing operation are significantly associated with a high prevalence of tumors by exposing nonpigmented skin to UV radiation (3). In previously reported cases, the majority of goats were also of pale pigmentation (6,14). In the present case series, all goats except 1 had some white coat coloring. The pigmentation of the perineal region, however, was not recorded. All of the goats presented to Texas A&M University were from herds located in Texas and all goats were kept at pasture during the day, potentially exposing them to high UV light levels. Tumor distribution in goats has included the perianal and vulvar region, face, eye, udder, and lung (7–10,15). In this case series, the lesions were localized to the perineal region. Two goats had lesions invading the rectal mucosa and 2 also had lesions on the tail. None of the goats had lesions in other locations on the body.

The duration of lesion presence prior to presentation varied from 1 to 18 mo (Table 1) and 7 cases presented in June or July, with several owners commenting that the lesions became more severe just before presentation to the Texas A&M College of Veterinary Medicine Large Animal Teaching Hospital. It is possible that the increased ambient temperature, sunlight, and fly population resulted in progression of the lesions. Additionally,

Table 1. Signalment, presentation, treatment, and outcome for 9 cases of perineal SCC in goats presented to the Texas A&M University College of Veterinary Medicine Large Animal Teaching Hospital

Case	Farm	Gender	Age (y)	Breed	Color	Month presented	Duration of tumor prior to treatment (mo)	Treatment	Outcome
1	1	MN	10	TM	Black	July 2008	6 to 12	Cryotherapy and surgery	Survived 3 y
2	2	F	4	ND	White	July 2011	3 to 4	Cryotherapy and surgery	Small masses recurred, survived
3	3	F	6	ND	Gray/White	July 2012	Unknown	Cryotherapy and surgery	Recurred 1 mo, euthanized
4	3	F	4	ND	Tri color	July 2012	Unknown	Cryotherapy and surgery	Survived follow-up 1 y
5	3	F	8	ND	Red and white	June 2013	Several	Cryotherapy and surgery	Survived follow-up 18 mo
6	4	F	5	TM	White	February 1990	18	Surgery only	Recurred at 3 mo, euthanized
7	4	F	Unknown	TM	White	November 1995	1	Cryotherapy only	Unknown
8	5	F	7	Pygmy	White and black	June 2013	5 to 6	Cryotherapy and surgery	1 mo recurred, euthanized
9	6	F	4	Boer X	White	July 2009	18	Cryotherapy and surgery	Unknown

MN — Male neutered; F — Female; TM — Tennessee meat goat; ND — Nigerian dwarf.

several cases came from the same herd (Cases 3, 4, and 5 and Cases 6 and 7). Multiple cases from the same herds could result from increased risk factors at those farms (specific breeds, coat colorings, or increased fly population) or owner awareness of the disease and increased treatment rate compared with other farms.

In previous reports tumors were removed surgically (14). In this study, goats were treated with surgical removal alone (1/9), cryotherapy alone (1/9), or both (7/9). Of the 1 case in which cryotherapy only was performed, the outcome was not available long term and the single case in which surgery was performed alone, the masses returned within 1 mo and the goat was euthanized. Of the 7 cases in which both treatments were performed, 3 survived and 2 had masses that recurred resulting in the goats being euthanized (Table 1). In 1 goat, small masses returned and cryotherapy and surgery were repeated several times. The small number of cases in this series and the lack of follow-up in 2 cases, make it impossible to relate outcomes to treatments. Both goats that had larger (6 cm × 8 cm and 12 cm × 12 cm × 8 cm, respectively) masses on presentation (Goats 6 and 8) were euthanized, at 3 and 1 mo, respectively. In the other non-surviving goat (# 3) the size of the recurring masses was unknown. It appears that outcome is linked more to the size of the initial mass rather than the treatment. However, analysis of larger numbers of cases in a prospective study is required. Other treatment options that could be used in future cases include hyperthermia, radiation, and chemotherapy; however, the treatment options are limited in the context of a food-producing animal. At initial presentation, there was no evidence of metastasis to lymph nodes in any cases; however, following treatment, there was spread to the lymph nodes in 2 goats. The masses also returned locally in 2 goats, one of which survived. Metastasis has previously been reported to the local pelvic cavity and sciatic lymph nodes in other cases of SCC in goats (14).

Ladds and Entwistle (16) reported that 4 of 33 (12%) sheep subjected to detailed necropsy had metastases.

Most previous reports of SCC in small ruminants have been in females, with 92% to 95% of affected sheep being females (5,16). In this study 8/9 goats were female. This gender predilection may be biased due to the larger number of females kept on a holding compared to males. Of the 9 cases, 5 were of Pygmy or Nigerian Dwarf breeding, 3 were Tennessee Meat breed, and 1 was a Boer. This distribution is weighted towards the smaller breeds compared to the general hospital population. In the previously reported literature, older females had higher incidence of SCC tumors (3–5,7). This is consistent with the age of goats in this study, which ranged from 4 to 10 y old with a median age of 5.5 y.

In conclusion, in this small sample of cases, SCC in goats appeared to predominate in smaller breeds, females, and animals with white coat coloring. Prognosis is improved if lesions are small at initial treatment requiring minimal debulking. Therefore, early treatment is key to success and maximizing animal welfare. Further investigation is needed to determine if papilloma virus has a role in the pathogenesis of this disease.

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References

- Méndez A, Pérez J, Ruiz-Villamor E, García R, Martín MP, Mozos E. Clinicopathological study of an outbreak of squamous cell carcinoma in sheep. *Vet Rec* 1997;141:597–600.
- Tsujita H, Plummer CE. Bovine ocular squamous cell carcinoma. *Vet Clin North Am Food Anim Pract* 2010;26:511–529.
- Swan RA, Chapman HM, Hawkins CD, Howell JM, Spalding VT. The epidemiology of squamous cell carcinoma of the perineal region of sheep: Abattoir and flock studies. *Aust Vet J* 1984;61:146–151.
- Hawkins CD, Swan RA, Chapman HM. The epidemiology of squamous cell carcinoma of the perineal region of sheep. *Aust Vet J* 1981;57:455–457.
- Ramadan RO, Gameel AA, el Hassan AM. Squamous cell carcinoma in sheep in Saudi Arabia. *Rev Elev Med Vet Pays Trop* 1991;44:23–26.

6. Ficken MD, Andrews JJ, Engeltres I. Papilloma-squamous cell carcinoma of the udder of a Saanen goat. *J Am Vet Med Assoc* 1983;183:467.
7. Yeruham I, Nyska A, Orgad U, Waner T. Perianal squamous cell carcinoma in goats. *Zentralbl fur Veterinarmed A* 1993;40:432–436.
8. Howerth EW, Butler A. Survey of goat tumors, Department of Pathology and Athens Veterinary Diagnostic Laboratory, College of Veterinary Medicine, UGA from 2007–2011. *Vet Pathol* 2011;48:E21.
9. Lohr CV. One hundred two tumors in 100 goats (1987–2011). *Vet Pathology* 2013;50:668–675.
10. Baipoledi EK. A case of caprine perineal squamous cell carcinoma in Botswana. *J South Afr Vet Assoc* 2001;72:165–166.
11. Vanselow BA, Spradbrow PB. Squamous cell carcinoma of the vulva, hyperkeratosis and papillomaviruses in a ewe. *Aust Vet J* 1983;60:194–195.
12. Tilbrook PA, Sterrett G, Kulski JK. Detection of papillomaviral-like DNA sequences in premalignant and malignant perineal lesions of sheep. *Vet Microbiol* 1992;31:327–341.
13. Alberti A, Pirino S, Pintore F, et al. *Ovis aries* Papillomavirus 3: A prototype of a novel genus in the family Papillomaviridae associated with ovine squamous cell carcinoma. *Virology* 2010;407:352–359.
14. Ramadan RO. Squamous cell carcinoma of the perineum of the goat. *Brit Vet J* 1975;131:347–350.
15. Mara M, Di Guardo G, Venuti A, et al. Spontaneous ocular squamous cell carcinoma in twin goats: Pathological and biomolecular studies. *J Comp Pathol* 2005;132:96–100.
16. Ladds PW, Entwistle KW. Observations on squamous cell carcinomas of sheep in Queensland, Australia. *Br J Cancer* 1977;35:110–114.